



ITRAC-3 Nuclear Science Training Course with NUCLEONICA  
Karlsruhe, May 11-13, 2011

Velko VeleV

**Institute of Public Health  
Ionizing Radiation Department  
Skopje, Republic of Macedonia**



- Established in 2002 in the frame of IAEA Technical Co-operation Project
- Purpose:
  - Calibration of radiation protection instruments used in:
    - Medicine,
    - Industry,
    - State border control,
    - Education and etc.
- Based on the ISO standards 4037-1/2/3
- In process of implementation of quality standard ISO 17025 (General requirements for the competence of testing and calibration laboratories)



## The main tasks of the laboratory are:

- Through the traceability of higher metrological standard, establishing and maintaining with a national metrological standard of Ionizing radiation dosymetry quantity in term of “Air Kerma” ( $K_{air}$ ) (Gy), for photon ionizing radiation only.
- Providing a instruments calibrations for radiation protection to the end users, in terms of:
  - Air Kerma ( $K_{air}$ ),
  - Ambient dose equivalent  $H^*(10)$ ,
  - Personal dose equivalent  $H_p(10)$  and  $H_p(007)$ .
- Contribution in the process of education to the students and other interested individuals for ionizing radiation metrology.



## Instruments can be calibrated at Laboratory





## Instruments can be calibrated at Laboratory







## Equipments on disposal:

### ☐ Irradiators:

- ✓  $^{137}\text{Cs}$  irradiator unit type ST OB6, 740GBq-May 2003,
- ✓ X-Ray irradiator with PANTAK 225kV high frequency

generator

### ☐ Traceable Standard Instruments:

#### ✓ Chambers:

- 1 x PTW32002/LS01 1 litre volume (secondary std. BIPM/PTB through IAEA),
- 1 x PTW32003/LS10 10 litre volume (secondary std. BIPM/PTB through IAEA),
- 1 x PTW32002/LS01 1 litre volume (working std.),
- NE2575 0,6 litre (working std.),

#### ✓ Electrometers:

2 x PTW type UNIDOS



## Irradiators





# **1 I. Referent Ionization Chamber LS01/32002**







**10 l. Referent  
Ionization Chamber  
LS10/32003**





## Referent Electrometers PTW - UNIDOS





## Laboratory capabilities

- ❑ Laboratory's referent ionizing radiation qualities, by the standard ISO 4037-1, includes the next :
  - X-Ray Radiation,
  - ( $\gamma$ )Gamma radiation



## - X-Ray Radiation:

- Filtered X radiation, within the energy range of (40 – 200) KeV,
- Traceability with higher standard is for qualities of narrow spectrum, “N ” series, with mean energy from 33 KeV to 164 KeV, denoted as: N-40; N-60; N-80; N-100; N-120; N-150; N-180 and N-200,
- Dose capabilities of the unit for  $K_{air}$  is:  
( $2,0 \times 10^{-4}$  до  $6,0 \times 10^{-2}$ ) Gy/h at reference calibration distance of 2m,
- Uncertainty of dose determining  $u\% = 4\%$  with approximately 95% confidence probability,  $k=2$



## - ( $\gamma$ )Gamma radiation:

- For high energy calibration, 740Gbp (May,2003)  $^{137}\text{Cs}$  nuclide source is used only.
- The energy of the gamma photons are 661.6 KeV.
- The referent radiation is denoted as a S-Cs quality.
- Dose capabilities of the OB6 unit for  $K_{\text{air}}$  is:  
( $7,5 \cdot 10^{-6}$  до  $5,0 \cdot 10^{-2}$  ) Gy/h.
- Uncertainty of dose determination is  $u\%=3\%$  with approssimately 95% confidence probability,  $k=2$



## Ionizing Calibration Laboratory







# International Audits

Regularly takes part in TLD audits for radiation protection calibrations, organized by the IAEA.

As a results of audits, a difference more than the 3% has never been shown between delivered /IAEA measured. The max. acceptable difference limit set by the IAEA is 7%.



Laboratory is a full member in the IAEA/WHO network of the secondary standard dosimetry laboratories from 2006th.



Thank you for your attention